

# SEARCH REQUEST FORM

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(FILE 'USPAT' ENTERED AT 19:01:01 ON 02 MAR 1999)

L1 16 S MALTITOL CRYSTAL#  
L2 0 S L1 AND BIPYRAMIDAL  
L3 37 S CRYSTALLINE MALTITOL  
L4 0 S L3 AND BIPYRAMIDAL  
L5 0 S L3 AND PRISMATIC  
L6 0 S L1 AND PRISMATIC  
L7 0 S (L1 OR L3) AND (TETRAHEDRONS JUXTAPOSED)  
L8 0 S (L1 OR L3) AND OCTAHEDRON#  
L9 7 S L1 AND L3  
L10 14 S (L1 OR L3) AND MALTITOL/TI  
L11 17 S (L1 OR L3) AND MALTOTRIITOL  
L12 12 S L11 AND MALTITOL/TI

=> d l10 1-14 cit ab

1. 5,873,943, Feb. 23, 1999, Process for manufacturing **crystalline maltitol** and crystalline mixture solid containing the same; Mitsuo Magara, et al., 127/29, 30, 40, 58, 60, 61; 426/658; 536/124, 127 [IMAGE AVAILABLE]

US PAT NO: 5,873,943 [IMAGE AVAILABLE]

L10: 1 of 14

ABSTRACT:

To provide an economically advantageous process for manufacturing **crystalline maltitol** and crystalline mixture solid containing **crystalline maltitol**. The process of this invention uses the syrup having a maltose purity of 81 to 90% as the starting material. The syrup is hydrogenated under the existence of catalyst, and then subjected to a chromatographic separation by using cation-exchange resin, resulting in an aqueous solution of maltitol having a maltitol purity of 94 to 99.9%. The aqueous solution, is further crystallized in the presence of a seed crystal, subjected to a separation, cooled and kneaded so as to manufacture both **crystalline maltitol** and crystalline mixture solid containing **crystalline maltitol** at the same time.

2. 5,651,829, Jul. 29, 1997, **Maltitol** composition and process for preparing it; Jean-Jacques Caboche, 127/32, 29, 30, 40, 42; 424/431; 426/656, 658; 536/1.11 [IMAGE AVAILABLE]

US PAT NO: 5,651,829 [IMAGE AVAILABLE]

L10: 2 of 14

ABSTRACT:

The invention relates to a novel **crystalline maltitol** composition which essentially exhibits a porous and honeycombed structure and which possesses a very high degree of maltitol purity and a low density. This composition possesses outstanding functional properties, making its use particularly recommended for manufacturing tablets or various powders to be dissolved in water.

The invention also relates to a novel process for enabling the **crystalline maltitol** composition to be manufactured.

3. 5,583,215, Dec. 10, 1996, Crystalline mixture solid containing **maltitol** and a process for preparing it; Shigeru Kawashima, et al., 536/127; 127/15, 16, 30, 58, 60; 426/658, 660; 568/863, 872 [IMAGE

AVAILABLE]

US PAT NO: 5,583,115 [IMAGE AVAILABLE]

L10: 3 of 14

ABSTRACT:

The crystalline mixture solid containing maltitol of the present invention has a crushed and relatively tight crystal structure which can be observed at 1,000 magnifications by a scanning electron microscope, an apparent specific gravity in the range of 0.650-0.750, an oil absorptivity of the powdered crystalline mixture solid containing maltitol having a particle size from 50 mesh to 20 mesh in the range of 7.0%-17%, in other words, is relatively heavy in apparent specific gravity and low in oil absorptivity, and the crystalline mixture solid containing maltitol is prepared by continuously supplying an aqueous solution of maltitol to an extruder provided with elongated cooling and kneading zones, cooling and kneading it in the presence of seed crystals to form a maltitol magma, and continuously extruded from a nozzle.

4. 5,470,591, Nov. 28, 1995, Sweetening syrup based on **maltitol** and confectionery using this syrup; Guillaume Ribadeau-Dumas, et al., 426/3, 572, 658, 660 [IMAGE AVAILABLE]

US PAT NO: 5,470,591 [IMAGE AVAILABLE]

L10: 4 of 14

ABSTRACT:

The subject of the invention is the use, as agent capable of controlling propagation of crystallization of maltitol present in a confectionery, of molecules having a molecular weight greater than 1,300. This use applies in particular to the preparation of boiled sugars and semicrystallized items.

The invention also relates to the use, in confectionery, of a sweetening syrup crystallizable to maltitol, having a bimodal composition spectrum and comprising more than 3% of an agent for controlling propagation of crystallization of maltitol having a molecular weight greater than 1,300.

5. 5,354,856, Oct. 11, 1994, Crystalline mixture solid containing **maltitol** and a process for preparing it; Shigeru Kawashima, et al., 536/127; 127/15, 16, 30, 58, 60; 426/658, 660; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 5,354,856 [IMAGE AVAILABLE]

L10: 5 of 14

ABSTRACT:

The crystalline mixture solid containing maltitol of the present invention has a crushed and relatively tight crystal structure which can be observed at 1,000 magnifications by a scanning electron microscope, an apparent specific gravity in the range of 0.650-0.750, an oil absorptivity of the powdered crystalline mixture solid containing maltitol having a particle size from 50 mesh to 20 mesh in the range of 7.0%-17%, in other words, is relatively heavy in apparent specific gravity and low in oil absorptivity, and the crystalline mixture solid containing maltitol is prepared by continuously supplying an aqueous solution of maltitol to an extruder provided with elongated cooling and kneading zones, cooling and kneading it in the presence of seed crystals to form a maltitol magma, and continuously extruded from a nozzle.

6. 5,304,388, Apr. 19, 1994, Method for manufacturing powdery **crystalline maltitol**; Ryuzo Ueno, et al., 426/658; 127/40; 426/660, 804; 536/124 [IMAGE AVAILABLE]

US PAT NO: 5,304,388 [IMAGE AVAILABLE]

L10: 6 of 14

ABSTRACT:

Disclosure is a method for converting maltitol into crystalline powder by

very simple procedures and in short time. To an aqueous solution of maltitol with 1-15% weight of moisture content, seed crystals of maltitol are added and a shearing force is applied continuously at a temperature lower than the melting point of the seed crystals, thus obtaining a powdery **crystalline maltitol**.

7. 4,917,916, Apr. 17, 1990, Food containing anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate; Mamoru Hirao, et al., 426/658, 589, 590, 660, 804 [IMAGE AVAILABLE]

US PAT NO: 4,917,916 [IMAGE AVAILABLE]

L10: 7 of 14

ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

8. 4,849,023, Jul. 18, 1989, Process for the preparation of a product with a high content of **maltitol** and uses of this product; Francis Devos, et al., 127/40, 36, 38, 46.1, 46.2, 46.3, 58; 426/3; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 4,849,023 [IMAGE AVAILABLE]

L10: 8 of 14

ABSTRACT:

Process for the preparation of a product with a high content of maltitol, characterized by the following steps:

- catalytic hydrogenation of a maltose syrup,
- chromatographic fractionation of the maltitol syrup formed during the hydrogenation step,
- adjustment to the desired dry matter of at least the fraction enriched in maltitol.

9. 4,846,139, Jul. 11, 1989, Process for the preparation of **crystalline maltitol**; Francis Devos, et al., 127/40, 36, 38, 46.1, 46.2, 46.3, 58; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 4,846,139 [IMAGE AVAILABLE]

L10: 9 of 14

ABSTRACT:

Process for the preparation of **crystalline maltitol** comprising successively:

- catalytic hydrogenation of a saccharified starch milk in a vessel 203,
- a step of chromatographic fractionation of the hydrogenated syrup in a vessel 204,
- crystallization and separation of the **maltitol crystals** in vessels 206 and 207 and
- recycling through a pipe 309 emerging from the vessel 207 of the crystallization mother-liquors to the head of the chromatographic fractionation step.

10. 4,831,129, May 16, 1989, Directly compressible powdered **maltitol** and its process of preparation; Michel Serpelloni, 536/124, 4.1, 8 [IMAGE AVAILABLE]

US PAT NO: 4,831,129 [IMAGE AVAILABLE]

L10: 10 of 14

ABSTRACT:

Directly compressible powdered maltitol having a richness in maltitol higher than 85% by weight and a compressibility, determined in a test A, higher than 80 N.

11. 4,789,559, Dec. 6, 1988, Anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate mixture solid

containing the crystals, and process for the production and uses thereof;  
Mamoru Hirao, et al., 26/658, 3, 578, 589, 599, 660 [IMAGE AVAILABLE]

US PAT NO: 4,789,559 [IMAGE AVAILABLE]

L10: 11 of 14

ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

12. 4,725,387, Feb. 16, 1988, Process of shaping anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals; Mamoru Hirao, et al., 264/6, 8, 13, 14, 118, 126, 330; 424/48; 426/48, 589, 599, 658, 660, 804; 536/4.1, 18.6 [IMAGE AVAILABLE]

US PAT NO: 4,725,387 [IMAGE AVAILABLE]

L10: 12 of 14

ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

13. 4,717,765, Jan. 5, 1988, Anhydrous crystals of **maltitol** and whole crystalline hydrogenated starch hydrolyzate mixture solid containing the crystals, and process for the production and uses thereof; Mamoru Hirao, et al., 536/124, 18.5, 18.6, 127 [IMAGE AVAILABLE]

US PAT NO: 4,717,765 [IMAGE AVAILABLE]

L10: 13 of 14

ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

14. 4,408,041, Oct. 4, 1983, Anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and process for the production and uses thereof; Mamoru Hirao, et al., 536/4.1; 424/48; 426/48, 589, 599, 658, 660, 804 [IMAGE AVAILABLE]

US PAT NO: 4,408,041 [IMAGE AVAILABLE]

L10: 14 of 14

ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

=> d 112 1-12 cit ab

1. 5,651,829, Jul. 29, 1997, **Maltitol** composition and process for preparing it; Jean-Jacques Caboche, 127/32, 29, 30, 40, 42; 424/431; 426/656, 658; 536/1.11 [IMAGE AVAILABLE]

US PAT NO: 5,651,829 [IMAGE AVAILABLE]

L12: 1 of 12

ABSTRACT:

The invention relates to a novel **crystalline maltitol** composition which essentially exhibits a porous and honeycombed structure and which possesses a very high degree of maltitol purity and a low density.

This composition possesses outstanding functional properties, making its use particularly recommended for manufacturing tablets or various powders to be dissolved in water.

The invention also relates to a novel process for enabling the **crystalline maltitol** composition to be manufactured.

2. 5,583,215, Dec. 10, 1996, Crystalline mixture solid containing **maltitol** and a process for preparing it; Shigeru Kawashima, et al., 536/127; 127/15, 16, 30, 58, 60; 426/658, 660; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 5,583,215 [IMAGE AVAILABLE]

L12: 2 of 12

ABSTRACT:

The crystalline mixture solid containing maltitol of the present invention has a crushed and relatively tight crystal structure which can be observed at 1,000 magnifications by a scanning electron microscope, an apparent specific gravity in the range of 0.650-0.750, an oil absorptivity of the powdered crystalline mixture solid containing maltitol having a particle size from 50 mesh to 20 mesh in the range of 7.0%-17%, in other words, is relatively heavy in apparent specific gravity and low in oil absorptivity, and the crystalline mixture solid containing maltitol is prepared by continuously supplying an aqueous solution of maltitol to an extruder provided with elongated cooling and kneading zones, cooling and kneading it in the presence of seed crystals to form a maltitol magma, and continuously extruded from a nozzle.

3. 5,470,591, Nov. 28, 1995, Sweetening syrup based on **maltitol** and confectionery using this syrup; Guillaume Ribadeau-Dumas, et al., 426/3, 572, 658, 660 [IMAGE AVAILABLE]

US PAT NO: 5,470,591 [IMAGE AVAILABLE]

L12: 3 of 12

ABSTRACT:

The subject of the invention is the use, as agent capable of controlling propagation of crystallization of maltitol present in a confectionery, of molecules having a molecular weight greater than 1,300. This use applies in particular to the preparation of boiled sugars and semicrystallized items.

The invention also relates to the use, in confectionery, of a sweetening syrup crystallizable to maltitol, having a bimodal composition spectrum and comprising more than 3% of an agent for controlling propagation of crystallization of maltitol having a molecular weight greater than 1,300.

4. 5,354,856, Oct. 11, 1994, Crystalline mixture solid containing **maltitol** and a process for preparing it; Shigeru Kawashima, et al., 536/127; 127/15, 16, 30, 58, 60; 426/658, 660; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 5,354,856 [IMAGE AVAILABLE]

L12: 4 of 12

ABSTRACT:

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5. 5,304,388, Apr. 1994, Method for manufacturing powdery **crystalline maltitol**; Ryuzo Ueno, et al., 426/658; 127/40; 426/660, 804; 536/124 [IMAGE AVAILABLE]

US PAT NO: 5,304,388 [IMAGE AVAILABLE]

L12: 5 of 12

ABSTRACT:

Disclosure is a method for converting maltitol into crystalline powder by very simple procedures and in short time. To an aqueous solution of maltitol with 1-15% by weight of moisture content, seed crystals of maltitol are added and a shearing force is applied continuously at a temperature lower than the melting point of the seed crystals, thus obtaining a powdery **crystalline maltitol**.

6. 4,917,916, Apr. 17, 1990, Food containing anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate; Mamoru Hirao, et al., 426/658, 589, 590, 660, 804 [IMAGE AVAILABLE]

US PAT NO: 4,917,916 [IMAGE AVAILABLE]

L12: 6 of 12

ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

7. 4,849,023, Jul. 18, 1989, Process for the preparation of a product with a high content of **maltitol** and uses of this product; Francis Devos, et al., 127/40, 36, 38, 46.1, 46.2, 46.3, 58; 426/3; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 4,849,023 [IMAGE AVAILABLE]

L12: 7 of 12

ABSTRACT:

Process for the preparation of a product with a high content of maltitol, characterized by the following steps:  
catalytic hydrogenation of a maltose syrup,  
chromatographic fractionation of the maltitol syrup formed during the hydrogenation step,  
adjustment to the desired dry matter of at least the fraction enriched in maltitol.

✓ 8. 4,846,139, Jul. 11, 1989, Process for the preparation of **crystalline maltitol**; Francis Devos, et al., 127/40, 36, 38, 46.1, 46.2, 46.3, 58; 568/863, 872 [IMAGE AVAILABLE]

US PAT NO: 4,846,139 [IMAGE AVAILABLE]

L12: 8 of 12

ABSTRACT:

Process for the preparation of **crystalline maltitol** comprising successively:  
catalytic hydrogenation of a saccharified starch milk in a vessel 203,  
a step of chromatographic fractionation of the hydrogenated syrup in a vessel 204,  
crystallization and separation of the **maltitol crystals** in vessels 206 and 207 and  
recycling through a pipe 309 emerging from the vessel 207 of the crystallization mother-liquors to the head of the chromatographic fractionation step.

9. 4,789,559, Dec. 6, 1988, Anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and process for the production and uses thereof; Mamoru Hirao, et al., 426/658, 3, 578, 589, 599, 660 [IMAGE AVAILABLE]

## ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

10. 4,725,387, Feb. 16, 1988, Process of shaping anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals; Mamoru Hirao, et al., 264/6, 8, 13, 14, 118, 126, 330; 424/48; 426/48, 589, 599, 658, 660, 804; 536/4.1, 18.6 [IMAGE AVAILABLE]

US PAT NO: 4,725,387 [IMAGE AVAILABLE]

L12: 10 of 12

## ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

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US PAT NO: 4,717,765 [IMAGE AVAILABLE]

L12: 11 of 12

## ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.

12. 4,408,041, Oct. 4, 1983, Anhydrous crystals of **maltitol** and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and process for the production and uses thereof; Mamoru Hirao, et al., 536/4.1; 424/48; 426/48, 589, 599, 658, 660, 804 [IMAGE AVAILABLE]

US PAT NO: 4,408,041 [IMAGE AVAILABLE]

L12: 12 of 12

## ABSTRACT:

The present invention relates to anhydrous crystals of maltitol and the whole crystalline hydrogenated starch hydrolysate mixture solid containing the crystals, and processes for the production and use thereof.